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PRODUCTIVITY AND THE AMERICAN ECONOMY: REPORT AND FINDINGS

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LETTER OF TRANSMITTAL

U.S. SENATE,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
Washington, D.C., August 17, 1982.

Hon. DAN QUAYLE,
Chairman, Subcommittee on Employment and Productivity, Committee on Labor and Human Resources, Washington, D.C.

DEAR DAN: Thank you for your letter informing me that your subcommittee has completed its hearings on the subject of labor productivity and for your request that the findings of the hearings be published as a committee print.

The issue of labor productivity is critical, especially in light of our maturing economy where employment opportunities are increasingly found in service industries. In addition, the issue is further complicated by the increased competition we are facing in international trade.

In view of these problems, I would like to commend you for your leadership in this area. I think it is essential that your recommendations be printed and publicized, and I am pleased to approve your request.

Sincerely,

ORRIN G. HATCH,
Chairman.

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PRODUCTIVITY AND THE AMERICAN ECONOMY

Report and Findings

The Employment and Productivity Subcommittee of the Senate Committee on Labor and Human Resources has completed a series of four hearings on productivity in the American economy. The subcommittee heard from thirty witnesses who included academic specialists, scientists, and representatives of established basic industries, high technology companies, service industries, labor and government. Witnesses presented their analyses of present trends in U.S. productivity performance and made a number of recommendations.

This report summarizes the testimony of the witnesses who appeared before the subcommittee, analyzes the major problems involved in the recent decline in productivity growth, and presents the subcommittee's findings and recommendations.

I. TESTIMONY OF WITNESSES

1. Productivity: Definitions, recent trends, and implications

There was general agreement that the most commonly used measure of productivity was output per man-hour, otherwise known as "labor productivity." Several witnesses noted that a multi-factor measure of productivity which would take into account the use of energy, capital and materials per worker would be extremely useful. The Bureau of Labor Statistics is currently developing multi-factor measures for major sectors and selected industries.

Witnesses agreed that productivity in the U.S., however measured, has been declining since the late 1960's. The actual decline in productivity has been alleviated to a certain extent by a reallocation of investment from less productive to more productive sectors of the economy. Nevertheless, the U.S. decline in productivity has continued for more than a decade, is serious, and if continued over the long-term may result in an ultimate decline in American living standards and U.S. international economic strength. All witnesses agreed that the problem is serious and significant, with major long-term implications.

2. Productivity trends in different industries

Productivity trends and the ability to measure productivity in different kinds of industry varies considerably. Currently, our information about productivity trends in the manufacturing sector is considerably superior to our productivity measurement in the service sector. This is so, despite the fact that services currently account for two thirds of U.S. Gross National Product (GNP).

One industry the subcommittee examined, the basic steel industry, is in a serious state of decline for a number of reasons. These include

rising labor costs compared to our international competitors, relatively poor labor to management relations, rising energy prices, and a loss of technological advantage. Witnesses agreed that the steel industry needed to modernize plants and close down less productive plants in order to become more competitive and productive even though this would mean a loss of jobs and heavy capital investment. This problem, of course, has evolved due to the decline in capital formation in the steel industry since the 1970's. Unfortunately our major competitors, on the other hand, have often had a significant investment advantage due to government subsidies.

In the high technology industries (i.e., pharmaceuticals, computers, and agriculture), productivity has been generally high. Fear was expressed by several witnesses, however, that our national expenditure levels on basic research and development (R&D) were declining. Witnesses agreed that the development of new technology was the leading factor in productivity improvement. The role of government in supporting basic research in cooperation with universities and the private sector was emphasized by a number of witnesses.

Inflation, rising energy costs, over-regulation by government, and a projected shortage in highly trained manpower were cited as the major problems facing U.S. manufacturing firms seeking to improve current productivity levels.

In the service sector, it was noted that the U.S. share of international trade was currently declining. Fear was expressed that the same trends that have recently afflicted U.S. manufacturing could also appear in the service center. More attention to the service sector, including productivity in government, was advocated by a number of witnesses.

3. The promise and problems implicit in new technology

A number of witnesses discussed the implications of recent technological advances in productivity. Over the long term, it was emphasized that the U.S. must adopt new scientific advances in order to improve the quality of manufactured goods while keeping costs down. Only then could the U.S. hope to remain competitive in the international marketplace.

Some witnesses noted that wider application of robots in manufacturing could provide a higher quality of precision products. They also noted that robots could eliminate dangerous, repetitive jobs that can be more efficiently performed by machines. The result would be a displacement of workers in some sectors of the economy. Over the long term, U.S. manufacturing would become more competitive, productivity would increase, and the economy would experience additional growth.

Other new areas of technology, while not employing many persons, have the potential for transforming whole industries. Biogenetic engineering may produce advanced goods in large quantities very cheaply in such industries as agriculture and pharmaceuticals. Only a small number of very high trained individuals would be needed to provide the technological breakthroughs that could likely transform U.S. productivity performance in the affected industries.

The problem of skill training for the new industries was mentioned by several witnesses. In addition, the effect of the application of new technology on currently employed workers was discussed, as well as

the phenomenon of workers becoming "de-skilled" by the use of "smart" machines in service sector jobs. It was noted that one of the advantages of the Japanese industrial system compared to the U.S. was the relative ease with which the Japanese could apply new technology in the work place. Japanese emphasis on savings, investment, research incentives, and lifetime employment were mentioned as factors explaining the Japanese high rate of productivity growth.

In sum, the highest growth rates in the U.S. today are in industries which utilize high technology and also in service industries which utilize new information technology. New jobs are being created constantly, by both large and small firms.

The industries that will grow most rapidly in the 1980's will be medical laboratories, nursing facilities, computers, office equipment, and hospitals. The greatest increase in jobs will occur in eating and drinking service areas, retail trade, hospitals and miscellaneous business services.

While we currently have more college graduates today than the labor market can absorb, the oversupply is only in certain occupational categories. College graduates have a low unemployment rate; the effect of an oversupply of highly trained persons on the labor market is to take jobs away from the less skilled who are naturally more difficult to employ.

Witnesses agreed that the U.S. is currently in a period of rapid technological change. They noted that curricula in schools need to be updated in order that students can be trained in skills usable in the job market. However, several witnesses agreed that because technology changes so quickly today, we probably cannot expect the schools to provide skills for long-term occupations. The need for periodic retraining to learn the new technologies will be necessary to improve the productivity of workers affected by the new fields.

4. Specific proposals to improve U.S. productivity performance

Witnesses stressed the need for direct government involvement in promoting productivity growth. They focused on three areas of policy: encouraging research, providing inducements for investment in new plant and equipment, and training the workforce in skills made necessary by the new technology.

(*1*) *Encouraging research.*—Proposals in this area include the following:

Tax write-offs for research and development.

Removing unnecessary federal regulation.

Establishing a national expenditure level of 3 percent of GNP for research and development.

A reorientation of federal research and development support toward the manufacturing industries.

Public support for research in a joint government-industry-university framework.

Direct federal investment in basic research.

Appropriate reform and application of the patent laws.

(*2*) *Inducements for increased investment.*—Proposals in this area include:

Basic tax reform, particularly tax simplification, which would eliminate the current tax law encouragement of spending at the expense of saving and investment.

Specific tax inducements to encourage saving and investment and discourage consumption.

Encouraging competition in industry with vigorous enforcement of the anti-trust laws to eliminate cartel behavior.

(*3*) *Training the workforce.*—Proposals in this area include:

Concern for a possible shortage in trained engineers (though witnesses disagreed on this).

Need for application of new skills in the school system at the earliest levels.

Revising the curricula now offered in the vocational schools.

Support for retraining displaced workers.

In addition, several witnesses emphasized the need for basic Federal government recognition of productivity improvement as central to our long-term economic recovery. Specific Federal programs to monitor and promote productivity improvement in the government and in the private sector were advocated. On the other hand. some witnesses stressed the importance of improving productivity in the work-place, within the confines of the business firm. Quality circles and labor incentives, as well as improved labor-management communication were proposed as important means of improving productivity.

II. FACTORS EXPLAINING THE DECLINE IN U.S. PRODUCTIVITY GROWTH

Productivity growth slowed to a crawl during the 1970's and continued decline could result in major distress for American society. Inflationary pressures will build if aggregate demand increases faster than the necessary goods and services. This could result in heightened conflict among social groups struggling for improvements in their living standards.

The causes of productivity growth and decline are complex, interdependent, and are rooted in all forms of economic activity. Productivity growth results from the decisions of individuals and business enterprises concerning saving and investment. Other decisions that affect productivity include: education, career changes, home improvements, automation equipment, and even retirement. Government policies with respect to employment, taxes, antitrust and defense also have an impact.

The federal government cannot and should not attempt to influence all decisions affecting productivity. In addition, the government cannot hope to have a single policy which would encompass all activities relating to productivity.

Policies to encourage faster growth in productivity must not be pursued in isolation from general macroeconomic policies. The major determinants of productivity, the quality of the labor force, the accumulation of capital and the pace of technological change, are closely interconnected. Unemployment, for example, adversely affects the acquisition of skills through experience and training. Economic slack undermines the incentive to invest in new plants and equipment, and to develop and adopt new technology. Inflation may also increase business uncertainty thus diminishing innovation and investment. Hence, a more stable economic environment would, in itself, make a major contribution to productivity growth.

1. Savings and investment policy

Many of the current policies and regulations in the U.S. were not designed for an era of inflation and high unemployment. As a result, we have come to a turning point in history. The U.S. is currently faced with policies and principles which do not mesh with the changes that have taken place in society over the past few decades. For example, tax policies encourage consumption and provide credit against interest accrued on expenses. Because buying power has been eroded by inflation, individuals have tended to convert their income to goods and real property as a hedge against inflation. This national tendency to consume rather than to save has resulted in a national average ratio of savings to disposable income below that of any other major industrial nation—less than one-fourth the averages of Italy and Japan; only one-third that of France, Germany and the United Kingdom; and, less than half that of Canada. (See chart on from Ratios of Savings to Disposable Personal Income).

The reluctance of individuals to save has led to diminished capital available for investment. This, in turn, has led to current high interest rates which are a disincentive to businesses who want to borrow capital in order to expand and update current operations. As a result, plants and businesses have not been able to invest in efficient equipment or up-to-date materials. In addition, the reduction in capital available for investment and the inability of businesses to expand has led to a downward trend in the capital/labor ratio.

RATIOS OF SAVINGS TO DISPOSAL PERSONAL INCOME: AND RATIOS OF GROSS FIXED CAPITAL TO GNP, SELECTED NATIONS, 1970–79

[In percent]

Period	United States	France	Federal Republic of Germany	Italy	Netherlands	United Kingdom	Japan	Canada
I. Ratio of savings to disposal personal income:								
1970	7.4	16.7	14.6	18.8	14.0	9.0	18.1	5.3
1971	7.7	16.8	14.3	20.6	15.0	8.5	17.5	5.9
1972	6.2	16.8	15.5	21.4	15.4	10.4	18.0	7.4
1973	7.8	17.3	14.9	20.9	16.5	11.9	20.5	9.1
1974	7.3	17.4	16.1	19.2	16.6	14.4	23.7	9.9
1975	7.7	18.6	16.4	23.0	14.5	14.0	22.5	10.9
1976	5.8	16.4	14.7	21.8	14.6	13.4	22.4	10.2
1977	5.0	17.3	13.7	23.1	12.8	13.3	21.1	10.0
1978	4.9	18.2	13.8	NA	12.9	14.1	20.1	10.4
1979	4.5	17.1	14.6	NA	NA	15.7	NA	10.3
II. Ratio of gross fixed capital formation to GNP:								
1969	18.1	25.4	24.1	20.1	24.3	18.3	35.1	21.0
1970	17.3	23.3	25.6	23.1	25.6	18.4	35.4	21.0
1971	17.7	23.6	26.4	20.2	25.7	18.3	34.2	22.0
1972	18.3	23.6	25.9	19.7	23.6	18.2	34.0	21.9
1973	18.4	23.8	24.5	21.2	22.8	19.1	36.6	22.5
1974	17.8	24.5	21.9	22.5	21.6	20.3	34.8	23.2
1975	16.3	23.2	20.7	20.6	20.8	19.6	32.2	24.2
1976	16.4	23.3	20.6	20.1	19.2	18.9	31.0	23.5
1977	17.4	22.2	20.8	19.7	20.9	18.3	30.1	23.0
1978	18.1	21.4	21.5	18.8	21.2	18.0	30.2	22.6
1979	17.9	NA	22.9	NA	NA	17.5	31.7	22.7

Basic data: U.S. Department of Commerce, International Administration, "International Economic Indicators", June 1979 and June 1980.

At the same time the labor force in the U.S. has experienced an increase in its growth rate, the country's capital stock has grown at a somewhat reduced rate. From 1947 to 1973, capital stock grew at an average annual rate of 4.0 percent. Since 1973, however, this average has been less than 2.5 percent. Net of depreciation, capital per employed individual rose at an average annual rate of about 2.0 percent from 1948 until 1969, but fell to about 1.2 percent thereafter.

A high capital-labor ratio figures significantly into an economy's productivity growth rate regardless of what measure is used. Since it is largely through new plant and equipment that more advanced technologies are introduced into the production process, the absence of increases in capital inputs will result in diminished marginal returns on each additional input of labor employed. One feature of those countries with high productivity growth rates is the resulting concomitant increases in capital-labor ratios. (See chart on Annual Growth in GDP per employed person).

2. Research and development policy

Another side-effect of the decline in personal saving and the erosion of buying power is the dramatic decline in R&D activities. Total spending in the United States for R&D declined from a peak of 3 percent of GNP in 1964 to 2.2 percent in 1979. Many U.S. competitors have, in recent years, increased their R&D expenditures. In the past twenty or so years, the R&D to GNP ratios have been rising substantially in Japan, France and Germany; our most vigorous rivals in international trade. In addition, a large portion of U.S. R&D has been devoted to defense and space research, in contrast to Japan and other European countries which have concentrated on manufacturing and industrial R&D.

Because of the gap between the time R&D is developed and the time it becomes profitable, there is some uncertainty as to the extent to which the decline in productivity growth rates is attributable to the decline in R&D spending. Yet R&D is a source of new knowledge and new technologies—ultimately, it will stimulate productivity growth.

AVERAGE ANNUAL GROWTH IN GROSS DOMESTIC PRODUCT PER EMPLOYED PERSON IN LEADING INDUSTRIAL COUNTRIES, 1960–79

[Percent change per year]

Country	1960 to 1979 [1]	1960 to 1970	1970 to 1979 [1]
United States	1.5	2.0	1.1
Belgium	3.7	4.2	3.2
Canada	1.9	2.3	1.3
France	4.2	4.9	3.4
Germany	3.9	4.4	3.4
Italy	4.6	6.4	2.6
Japan	7.1	9.5	4.5
Netherlands [2]	3.6	4.0	3.3
United Kingdom	2.4	2.7	2.0

[1] Data for 1979 are preliminary.
[2] Employment figures for the Netherlands are Dutch estimates of work years of employed persons.
Source: U.S. Department of Labor, Bureau of Labor Statistics, unpublished data.

An increase in R&D spending, in both the public and private sectors, should encourage the growth of new technologies, such as biotechnology or energy technology, as well as increase the output per worker hour through increased use of robotics or other new manufacturing techniques. The innovative process is related to such basic factors as the prospect of economic gain, the degree of uncertainty surrounding economic decisions, and the quality of business management. Government plays only a secondary role in this process, but its actions influence the climate for innovation through policies in areas such as taxation, regulation of business, patent law, scientific investigation and information dissemination.

3. Employment and training policy

Development of new jobs and training (or retraining) for new jobs is one of the most significant challenges facing the United States today. Unemployment in our country stands at its highest since the Great Depression. In addition, unemployment has taken on new and alarming dimensions. The majority of layoffs are no longer limited to construction, steel and autos—which have long been in a slump. Unemployment has spread to oil drilling and refining, paper, textiles, chemicals and mining. Along with union workers and the unskilled, white collar workers are hitting the unemployment lines in startling numbers. States that once escaped unemployment are feeling the bind of the recession. Texas, which once was viewed as the promised land to laid-off auto and manufacturing workers from the Midwest, is just one area of the Sunbelt which has been equally hard-hit by the recession. With new oil and gas exploration down more than 15 percent, and building trades and manufacturing slipping, a prominent Texas union official has been prompted to warn those unemployed to seek employment elsewhere.

Other parts of the Sunbelt are in a similarly tenuous position. Alabama now holds the highest unemployment record in the South at 14 percent. This is due to the slump in construction and manufacturing industries. Steel plants, once major employers in the state, now threaten to close their doors permanently. In Florida, the slump in the demand for fertilizer mined from phosphate threatens to hasten the closing of those operations which employ significant portions of entire counties.

This surge in the unemployment rate and other changes in the quality and make-up of our workforce affect the productivity growth rate. Generally, labor productivity is affected by changes in the size, quality and composition of the labor force. An increase in the labor supply can mean a decline in the productivity growth rate, simply because it reduces the capital-labor ratio. Similarly, an increase in quality in the areas of labor, skill, health and worker effort tend to raise productivity. Such things as poor education and training systems, discrimination, and poverty all contribute to poor productivity growth rates since they result in poor worker performance or skill development.

One explanation for the reduction in our labor productivity growth rate is the shift in the sex and age composition of the workforce which began around 1966. Women and youth, the new entrants into the labor force, have had less job training and work experience than adult males already in the workforce. The average level of productivity of women and youth has therefore been lower than that of the more experienced adult male workforce.

Changes in the mix of employment among different sectors of the economy, may also alter productivity growth rates. Some sectors of the private business economy are more productive than others. In the 1948 to 1966 period, labor shifted out of agriculture (a low productivity goods and service sector). This shift contributed to the high rate of growth of productivity during the period from 1948 to 1966. By the mid 1960's the shift of labor out of agriculture was largely complete, and only 5 percent of the workforce remained in agriculture. Differences in the level of productivity between the farm and non-farm sectors had been reduced as well. Some economists believe that these developments in agriculture greatly diminished the productivity gains that might have been realized from the shift of labor out of agriculture.

The shift of labor into the service sector of the economy is also sometimes viewed as the cause of the productivity slowdown. Some experts believe that services do not create "real" wealth and that any genuine increase in the service sector, and away from manufacturing will tend to move the means of production out of U.S. control and into other countries. Our dependence on manufactured goods from other countries could turn out to be an implicit danger to our national security. As imports increase, our dependence will increase and that dependence is likely to remain concentrated in areas of transportation equipment, steel, electronics, and petroleum—all vital to our national defense.

At the same time that we are experiencing severe unemployment problems, there are also acute shortages of workers in some critical skill areas. Experts project severe shortages of engineers, software analysts, hardware technicians, chemists, biochemists, health technicians, skilled machinists and telecommunications workers. The Bureau of Labor Statistics has projected that in the years ahead there will be nearly a 50 percent rise in the jobs that require computer skills, this projection surpasses that of all other occupational groups. (See table on the present and future of computer employment.)

It is the spectacular rise in the proliferation of computers into every sector of our society that is fueling the great need for computer technicians. The phenomenal advances in hardware, software and applications have made computers cost-efficient and suited to the needs of businesses of all kinds and sizes. The advances in this field are staggering.

THE PRESENT AND FUTURE OF COMPUTER EMPLOYMENT

[Entry-level and senior-level salaries are 1982 figures]

Job title and description	Number employed		Projected percent growth	Entry-level salaries	Senior-level salaries
	1980	By 1990			
Systems analyst: Determines hardware, software best suited to solve information-processing problem	234,000	400,000	64.6	$19,700	$30,600
Applications programer: Prepares instructions that make computer perform specific task	341,000	500,000	46.6	17,200	25,100
Operator: Enters data and instructions in system; operates computer and retrieves results	522,000	850,000	62.8	21,300	24,300
Technician: Installs and repairs computer systems	83,000	160,000	92.8	12,600	17,900
Data entry: Operates machines with keyboard, enters information into computer on magnetic tapes, disks or cards	266,000	230,000	−13.5	10,400	13,200

Sources: Bureau of Labor Statistics; Hansen Data Processing Survey.

There are now approximately 730,000 computer systems in operation and that number is expected to double by the end of 1985. The number of computer terminals now estimated at 5 million is expected to exceed 11.5 million within four years. Expenses for personnel are expected to grow from $31 billion in 1981 to $34.5 billion in 1983. Hardware and software companies earned $3.5 billion for packaged programs last year and are expected to almost quadruple that figure in the next five years. Projections of these statistics through 1990 indicate that there will be 685,000 new jobs for people with computer training. Most of the 1.4 million jobs are currently concentrated in and around major urban areas, but geographic distribution of jobs will grow as more large companies with fields offices purchase minicomputers tied to data processing networks. Although there has been a 400 percent rise in the number of jobs in this field in the last decade, the number of new jobs created each year far outstrips the number of qualified applicants.

Experts also predict an acute shortage of engineers who specialize in high technology fields such as fiber optics, genetics and microprocessors. The numbers in this case are significant since the U.S. does not compare favorably with industrialized nations in the number of engineers it currently graduates. Nearly 60,000 engineers graduate yearly in the United States, compared with 300,000 in the Soviet Union and nearly 75,000 in Japan.

Historically engineers have found themselves in a feast or famine position. A few years ago major airframe makers, faced with declining orders laid-off many aeronautical engineers and other highly skilled technicians. Fundamental changes in engineering will not eliminate our need for qualified engineers. Our needs will probably increase. But the engineers who will be most in demand will not only have to offer specialties that fit changing conditions; they will have to constantly change their skills to meet future job needs.

Another field that will be greatly in demand in the 1980s is medical technology. The Bureau of Labor Statistics reports that the number of medical technologists increased from 293,000 in 1971 to 446,000 in 1979. Similarly, the National Cable Television Associates reports that the number of cable employees today is up 60 percent from 1975 and the openings are still growing.

Advances in technology today are causing concern to many in the labor movement. There is a persistent uneasiness that advances in automation will accelerate a decline in the workforce. While high technology fields are expected to continue to grow for some time, advances in automation could intensify the joblessness growth that has been taking place in industrial countries in recent years.

III. SUBCOMMITTEE RECOMMENDATIONS

The Nation's productivity problem is complex and we have no simple explanation of it and no simple solution for it. Further, when we speak of reversing the current slump, we do not necessarily mean that we must, or can, reverse all the forces which have contributed to the decline. Therefore, in these recommendations, we will present broad suggestions for change to which the full committee and the Congress should turn their attention.

Specifically, we would encourage Congress and the Administration to commit themselves to making a long-term effort to improve labor quality. Rising unemployment causes an intense strain on the economy and upon society generally. While we recognize that our social and economic structure is changing rapidly, we must realize that the pace of change has outstripped the capacity of some groups to meet the needs of a changed society.

Second, we recognize that a stable, growing private economy is the essential prerequisite for increased productivity. To make our economy healthy in the long run, we must create an economic environment in which personal saving and capital investment are sufficient for economic growth.We must therefore modify current policies, including tax policies, which encourage consumption, discourage savings, and serve as disincentives to economic expansion.

The United States is still the world's leading economic power, but our position as world leader in international trade has gradually slipped over the past two decades. A firm commitment to maintaining our role as leader in world trade may mean some hard business decisions and a fundamental rethinking of our management techniques, financial planning, and the importance we place on marketing improvements in technology.

Some of the U.S. productivity slowdown can be attributed to forces beyond government control. For example, changes in the sex and age mix of the workforce probably have contributed to the decline in our productivity growth rate. Still, the economy has shown remarkable resiliency in absorbing these workers and we recognize that these new work groups have entered the workforce largely because of economic necessity. Also, once these new workers are trained and experienced, their level of productivity will improve.

No discussion of the decline in productivity would be complete without mentioning the effect of rising energy prices. Much of our technology in transportation and utilities was developed on the assumption that petroleum and natural gas were plentiful and cheap. We know this is no longer true. As in all other energy intensive economies, the oil price wars of the 1970's sent a shock wave through the U.S. economy. Increases in the cost of energy made many machines and equipment relatively inefficient. Businesses removed much energy consuming machinery from stock, thus reducing net capital stock. This contributed to the decline in the capital to labor ratio, as discussed earlier. However, the shortage of oil and gas stimulated new exploration, and new production technology in the mining sector which increased mine safety, but reduced output per labor hour. This reduction in output per labor hour in mining was another contributor to the productivity slowdown—one which we do not wish to reverse.

While we recognize that some of the causes for slower productivity growth will benefit or society in the long run, we cannot excuse ourselves from pursuing suggestions for improving our productivity growth rate. There were a number of productivity-lowering factors operative in the 1970's as there are now, which could respond to Congressional actions. These include extraordinarily high interest rates, a high inflation rate, excessive Federal spending, a low level of private saving and business investment. the tragedy of high unemployment and inadequate job training and declining research and development spending.

1. Encouraging research and development

Virtually every witness before the Subcommittee on Employment and Productivity strongly recommended increased R&D activities to promote long-term productivity growth. Vibrant R&D activity encourages productivity growth through the development of new products, new technologies, the advancement of commercial applications for products and by improving the less tangible determinants of productivity such as work environment and workplace safety. The innovative process, which underlies R&D, is believed to be influenced by many fundamental factors such as the prospect of economic gain. The government plays a somewhat secondary role in encouraging innovation, but clearly discourages innovation through its tax policy, regulation of business, and patent laws. While this section explores trends in innovation, we will also discuss some policy recommendations which might improve the climate for innovation.

(a) The importance of technological innovation and trends in spending.—We have already stated that R&D is important because it stimulates technological progress, which generally results in increased productivity. While it is nearly impossible to gauge the direct relation of our productivity slowdown to a decrease in R&D spending, some experts believe that since our decline in R&D spending occurred at about the same time that our productivity began to go downhill, the two are related.

Research and development is an indirect measure of innovation in our economy. Patents awarded and foreign trade may be other measures, but they are indirect as well. R&D does not mark the pace of innovation, but rather underlies and encourages it. Our panelists stressed that innovation depends on creativity, commercial development and diffusion of technology throughout our economy. Innovation and the R&D which supports it is a non-commercial activity which has a commercial result and which, in the long run raises our productivity and our standard of living.

The government could also increase its reliance on its partnership with colleges and universities in which basic research is performed in the course of ordinary business. The university should be looked upon as a major national resource for stimulating R&D. Universities are responsible for training and educating our engineers and scientists and are thus in contact with the frontiers of knowledge and have freedom to conduct R&D without competitive pressures. The education of graduate students frequently focuses on active involvement with research projects. Increased funding for such scientific and technical work should be given a high priority in the Federal budget.

There is another reason why the Federal Government should place greater emphasis on using universities in basic R&D. Our country's technical and engineering schools can be used to a much greater extent to help solve our national productivity problems. In Western Europe and Japan where productivity rates have been growing dramatically, there has been a long-standing cooperative effort between major manufacturing industries, government and the technical universities which fuel growth. Universities provide the most up-to-date training for tomorrow's scientists and engineers—this labor force provides the manpower to meet the needs of a highly technological society and will encourage the United States to develop and maintain

a competitive manufacturing industry. Furthermore, cooperative government, industry, university research programs can be used to reduce the risks and costs of heavy research.

(*b*) *Patents.*—Trends in patents granted are another indicator of the presence of innovation which stimulates technological progress and produces a healthy and productive economy. Patents granted in this country have been declining since 1973 and are nearly at the same level as in 1961. However, the number of patents granted to foreigners has been increasing and in 1978 and 1979, 38 percent of all patents were granted to foreigners.

Patent policy might be improved by a first-to-file system which would eliminate patent interference proceedings for some industries.

U.S. PATENTS GRANTED TO U.S. INVENTORS, BY TYPE OF OWNER, 1961–79

Year	By date of application					By date of patent grant				
	All patents	U.S. corporation	U.S. Government	U.S. individual [1]	Foreign [2]	All patents	U.S. corporation	U.S. Government	U.S. individual [1]	Foreign [2]
1961	NA	NA	NA	NA	NA	40,154	27,383	1,460	11,233	79
1962	NA	NA	NA	NA	NA	45,579	31,377	1,276	12,817	109
1963	NA	NA	NA	NA	NA	37,174	25,722	1,017	10,358	77
1964	NA	NA	NA	NA	NA	38,411	26,808	1,174	10,336	93
1965	42,205	30,155	1,426	10,475	149	50,332	35,698	1,522	13,032	80
1966	45,004	32,887	1,481	10,412	224	54,634	39,891	1,512	13,050	181
1967	44,153	32,040	1,562	10,313	238	51,274	36,745	1,726	12,634	169
1968	45,315	33,084	1,707	10,242	282	45,783	33,351	1,458	10,768	206
1969	46,364	33,737	1,807	10,505	315	50,397	37,160	1,810	11,208	219
1970	45,805	33,028	1,614	10,852	311	47,075	35,067	1,763	9,968	277
1971	45,516	32,594	1,581	11,062	279	55,976	40,945	2,135	12,462	434
1972	42,351	30,558	1,507	10,055	231	51,516	37,861	1,768	11,553	329
1973	42,630	30,467	1,375	10,561	227	51,503	36,860	2,082	12,293	268
1974	41,607	29,955	1,556	9,839	257	50,645	36,137	1,735	12,468	305
1975	41,668	29,886	1,467	10,121	194	46,708	33,408	1,882	11,163	255
1976	40,229	28,121	1,292	10,593	223	44,271	32,139	1,807	10,070	255
1977	NA	NA	NA	NA	NA	41,484	29,563	1,480	10,227	214
1978	NA	NA	NA	NA	NA	41,233	29,394	1,226	10,361	252
1979	NA	NA	NA	NA	NA	[3] 30,061	[3] 21,125	[3] 946	[3] 7,794	[3] 196

[1] Includes unassigned patents.
[2] Comprises patents assigned to foreign corporations, governments, and individuals.
[3] Patent counts for 1979 are spuriously low because of a lack of funds in the Patent Office for printing and issuing patents.
NA—Not available.

Sources: 1960–65: Office of Technology Assessment and Forecast, U.S. Patent and Trademark Office, "Special Report: A Profile of U.S. Patent Activity"; 1966–79: Office of Technology Assessment and Forecast, U.S. Patent and Trademark Office, "Indicators of Patent Output of U.S. Industry, IV (1963–1979)," June 1980. National Science Foundation, "Science Indicators 1980," NSB–81–1, p. 290

Another critical problem is the resolution of disputes over issued patents. The cost of resolving these disputes is great and requires so much time that it fails to enhance the operation of the system. We believe that Congress should consider seriously the possible use of arbitration as a method of settling such disputes. Further improvement in the appeals procedures with respect to patent rights is necessary to provide national standards in patent law. Finally, we recommend that Congress provide for the reexamination of patents from time to time so that patents without proper foundation can be removed from consideration quickly.

2. Increasing saving and investment

One of the reasons frequently cited as a cause of our productivity slowdown is the tendency of Americans to consume in the short-term rather than to save. While Americans do save a large portion of their income, much of that savings is directly related to investment in housing and other durable goods. One major cause of our inclination to spend rather than to save and invest is the treatment of interest earned and owed under our tax system.

This tax imbalance is exemplified by the favorable tax treatment of housing and to a lesser extent, durable goods. Capital gains on owner-occupied housing is taxed at a relatively low rate, while income from financial assets, including capital goods that underlie them, are all taxed at a higher rate. Rate of return on alternative assets after allowing for inflation and taxes are important in determining the ways in which individuals save. People prefer more income to less, and thus they prefer higher yields (adjusted for risk) to lower yields. For the past 10 years or so, investment in housing has provided one of the highest rates of return available to most savers. Some recent changes to the tax system, such as the introduction of accelerated depreciation and the expansion of Individual Retirement Accounts (IRAs) have helped to ease the individual's tax burden slightly. One provision of the Windfall Profits Tax Act of 1980 increased the interest income deductible to $200. Many experts agree, however, that such a small exclusion will be unlikely to affect aggregate levels of savings.

Our tax system directly affects the private decision to invest and save or to consume. During this time of low productivity growth, we have come to recognize that our tax system was not designed for an era of high inflation and unemployment. Our tax system encourages spending, and gives credit against interest paid; it discourages savings, and taxes interest income. In an effort to provide some shelter from excessive taxation of productive assets, we have created many credits, exclusions and exceptions. The consequence has been that in our effort to measure income more equitably and accurately, we have created an extremely complex and administratively burdensome tax system.

Our tax structure's promotion of consumption and investment in housing and durable goods has been a major factor in contributing to our current productivity decline. Basic tax simplification will probably be necessary in order to devise a system that raises revenues while encouraging savings and investment. Such reform should also encourage efficiency and productivity growth which would benefit taxpayers as well as the government.

Some experts have estimated that approximately half of all government created paperwork results from tax forms, requiring an estimated expenditure of 650 million man hours annually. The system increasingly lacks the cooperation of the taxpayers. The Internal Revenue Service (IRS) has estimated that as much as 15 percent of all income now goes unreported. This is perhaps the highest percentage in the history of the Service. To put that percentage into dollars, consider that the income tax compliance gap is estimated to have grown from $21 billion in 1973 to $76 billion to 1981.

The burden which our tax system presents in perhaps best exemplified by its regulatory cost. At present, IRS maintains a workforce of 50

attorneys who spend about 65 percent of their time writing regulations authorized by Congress. Today those IRS regulations, as contained in Title 26, of the United States Code occupy nearly 10,000 pages. The complex nature of our tax system has the effect of requiring more, rather than fewer, regulations and the need for increased enforcement shall ultimately require expansion of existing regulations.

The many loopholes in the present tax system effectively redistribute the tax burden and reduce the published progressive tax rates. By allowing the exclusion of substantial portions of income from the tax base, rates imposed on the remainder must be kept high to maintain Federal revenues. For example, in 1961 only 10 percent of U.S. tax returns had a marginal tax rate of other than 20 to 22 percent. In that year we had a nearly flat rather than progressive schedule of tax rates.[1]

Published tax rate schedules today are much more progressive than they were in 1961, but we also have enacted a profusion of tax exemptions. In 1982 tax rates will range from zero to 50 percent, but current law provides for over a hundred exclusions, exemptions, deductions, preferential tax rates, credits and tax deferrals which allow for relief or exemption from those rates. These "tax expenditures" either reduce taxable income or reduce taxes by applying lower rates, credits or delays in tax payment. Estimated lost revenue in 1982, due to tax expenditures, will be over $250 billion. This is over twice the size of the estimated Federal deficit.

Average tax rates, as a percent of personal income, have increased in the United States, despite the passage in 1964 and 1981 of laws which substantially lowered maximum tax rates (from 91 to 70 percent in 1964; from 70 to 50 percent in 1981).[2] Between 1951 and 1981 the average tax rate, as a percentage of personal income, rose from 9.2 percent in 1951 to 12.1 percent in 1981.

Because of the complexity of the tax laws, equity has been sacrificed; taxpayers with the same income may pay very different rates of tax depending on their eligibility for the different tax preferences. Tax expenditures have rendered the otherwise progressive tax system far less progressive, partly because tax loopholes are most widely used by taxpayers in high income brackets to reduce their tax burden. Also, these are the taxpayers who are most able to afford tax specialists to help them take advantage of tax preferences.

3. Improving labor quality

Labor productivity is influenced by changes in the quality of labor and the size of the labor force. Improvement in the quality of labor, in skills, health, and work effort tends to raise productivity. Barriers to skill development such as poverty or discrimination tend to lower productivity. Conversely, an increase in the size of the workforce tends to reduce productivity because it lowers the amount of capital available per worker.

Several changes in the nature of work and the workforce have had important effects on productivity. First, the rapid growth in the labor force as a result of the 1950's baby boom has contributed to the reduc-

[1] Eugene Steurle and Michael Hartzmark. "Individual Income Taxation, 1947–1979," National Tax Journal v. 34. June 1981, p. 156.
[2] J. Pechman, Federal Tax Policy (Brookings Institution), Table A–2, p. 300.

tion in capital available per hour per worker. The rapid influx of young and inexperienced workers and of women returning to the workforce has dampened our productivity growth rate, at least temporarily.

Because the workforce is expected to grow more slowly in the 1980's and 1990's, this trend should be reversed. In fact, according to one study, changes in the age and sex composition of the employed labor force reduced total factor productivity growth by an average of 0.4 percentage points from 1966 to 1973, and 0.2 percentage points from 1973 to 1978. Over the 1980 to 1990 period, this study projected that demographic shifts would have a slightly positive influence on productivity growth (0.1 percentage point annually).[3]

Unemployment also has an adverse effect on productivity. Although higher rates of unemployment may raise the capital/labor ratio, it is estimated that for every percentage point of unemployment, the Federal deficit is increased by $25 billion. This causes extraordinary stress on the economy.

During periods of rising or high unemployment, the employed become more concerned with job security than about upgrading to better paying jobs. During the late 1950's and early 1960's there was wide-spread concern that automation would displace many workers. Automation has changed the nature of work and has displaced some workers, but evidence shows that automation creates more jobs than it eliminates. The economic growth of the 1960's provided a strong incentive for workers in declining industries and occupations, as well as for new labor force entrants to learn new skills and enter new occupations. A strong economy makes workers much less resistant to change. In a stagnant economy there is a much stronger incentive to preserve existing jobs by resisting the spread of new technologies or by appealing to the government to bail out failing corporations or raise barriers to imports.

Many witnesses recommended review of policies to assist the dislocated worker, to provide training and educational incentives to engineers and technicians, to improve long-term labor and management relations and to provide for continuous upgrading of worker skills.

(*a*) *Dislocated workers and the disadvantaged.*—Among the unemployed there is a growing percentage of dislocated workers. Many basic manufacturing industries such as steel and transportation equipment, as they decline in their ability to compete in domestic and international markets, displace thousands of workers. For most of the unemployed, employment will come with the recovery of the economy; their unemployment will have been merely a painful interlude between periods of productive employment. But the displaced worker, even with economic recovery, has no reasonable prospect of returning to his old job. The effects of this massive displacement of workers due to technological change or to changes in consumer demand has far-reaching effects on individual workers, their families, their communities and the nation as a whole. These workers have little likelihood of ever being recalled to their old jobs, or even to their previous industry as the economy improves. They have job skills that are no

[3] John W. Kendrick, "Productivity Trends and the Recent Slowdown: Historical Perspective, Causal Factors, and Policy Options", in William Fellner, ed. *Contemporary Economic Problems*, (American Enterprise Institute, 1979), page 33.

longer in demand and no longer marketable. This causes an inordinate strain on unemployment compensation and other forms of public assistance. The economic pressures on these displaced workers clearly are a cause for considerable concern. Equally important is the concern for the personal impact of long-term, seemingly hopeless unemployment for persons who have been effective, productive and strong contributors to the Nation's economy.

New employment and training services will be needed to provide assistance to displaced and disadvantaged workers. Assistance programs should include job search and development, training in job skills, and relocation assistance. Emphasis should be placed upon programs conducted in cooperation with employers or labor organizations to provide early intervention in the event of a plant closure.

Another area ripe for change is traditional labor-management relations. In the past several decades, labor-management relations have improved very little. One suggestion for improving labor-management relations, and thus productivity growth rates, is increased use of labor-management committees and quality circles. These committees and quality circles have been demonstrated to increase output, improve product quality and reduce employee turnover. The Japanese, who are looked upon as having made great strides in labor-management coordination, have devoted much time and effort to labor-management committees. Such techniques used by the Japanese have been tried in the United States with considerable success.

Improving labor-management communication is an important tool for increasing labor productivity. Many witnesses from industry reported that relations with their employees were improved when employees participated in decision making and opened better communication links to management. Sharing information relating to operation and the future of their companies produced beneficial results in both the long and short terms. In addition, communication among peers in quality circles provided reinforcement for desired performance.

Formal labor-management committees can provide a similar service on a larger scale. They improve communications between management and union or employee representatives and provide recommendations for improving products, techniques and working conditions. Labor unions and industry should join together in placing more emphasis on improving labor-management relations to increase worker productivity, upgrade workers skills and assist workers who are or will soon become dislocated workers.

(*b*) *Shortage of skilled technicians and engineers.*—Even as the nation is experiencing a high level of unemployment, there are shortages of workers in many high technology fields. Scientists, engineers and computer technicians are in great demand today and positions for these and other professional jobs are expected to increase in the coming two decades. The emerging computer integrated manufacturing, computer aided design and flexible manufacturing system technologies will be recruiting thousands of workers and will need many more employees than there are currently trained and available.

In order to meet the employment needs of the future, educational programs for young people should provide students with a better foundation in grammar and mathematics. Education should also focus

on basic computer theory and use, because that is the direction in which many careers will develop in the coming years. One distinguished witness, when asked what he thought we should be doing to develop more jobs, responded that he had visited a school system for a major Midwestern city in which there was not a single computer; he said that he would not make that same mistake and felt the computer should be essential in any school system. Computer skills will prepare young people to deal with the information age rather than to learn the skills of the industrial age. More computer terminals and classes in schools will expose students to the theories and skills they will need during their careers.

In advanced education, technical and engineering schools should be geared toward attracting the best students; students who are drawn by the challenge of the work and the opportunity to solve a variety of problems that are at once the leading edge of technology and of practical importance. In order for the United States to retain a competitive manufacturing industry, universities must take the responsibility to train a generation of technicians and engineers who can meet the challenges of the next 20 years, not the past 20. Accomplishing this task will be difficult and expensive, because it must occur in tandem with radical changes in entering students' skills, and escalating complexity and costs of the equipment and facilities needed.

(*c*) *Increased employment in services industries.*—Service industries have increased in importance in our economy. They account for a major percentage of our GNP, but have only slightly more representation than was present two decades ago. While growth in the service industries is believed by some to displace manufacturing activities, careful review shows that increases in the service sector share of GNP has largely been offset by decreases in the government, agriculture, mining and construction sectors rather than manufacturing. During the same period, there has been some decline in overall manufacturing employment by about 4 percentage points. There has also been a decline in employment in agriculture, while employment in service related industries has increased its share of civilian employment from 50 percent in 1970 to 55 percent in 1980. Consequently there is reason to believe that there should be some further growth in service related jobs in the next few years.

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